

**FOR USE ONLY BY THE EXAMINER**

***CLAIMS WITH INTERSTITIAL REFERENCE NUMBERS***

***FOR DISCUSSION PURPOSES ONLY***

**CLAIMS**

What is claimed is:

1. An apparatus for determining time remaining for fluid flow at a temperature from a fluid outlet [14] which receives fluid from a fluid source [18], comprising:
  - a first temperature sensor [22] for sensing fluid temperature at a fluid outlet [14];
  - a second temperature sensor [34] for sensing fluid temperature at a fluid source [18];
  - a communication link [29]; and
  - a controller [38] in communication with said first temperature sensor [22] and said second temperature sensor [34] via said communication link [29], for comparing sensed fluid temperatures to determine time remaining for fluid flow at a temperature.
2. The apparatus of claim 1 wherein said communication link [29] comprises a wireless communication link.
3. The apparatus of claim 2 wherein said wireless communication link [29] comprises a radio frequency communication link.
4. The apparatus of claim 1 wherein said communication link [29] comprises a hardwire communication link.

5. The apparatus of claim 1 wherein said first temperature sensor [22] comprises an integrated circuit temperature sensor [22].

6. The apparatus of claim 1 wherein said first temperature sensor [22] comprises a thermocouple.

7. The apparatus of claim 1 wherein said first temperature sensor [22] comprises a sensor system comprising [22]:

a temperature sensor [24];

a radio frequency transmitter [28];

a power supply [30]; and

a housing enclosing said temperature sensor [24], radio frequency transmitter [28], and power supply [30] for protection from the environment.

8. The apparatus of claim 7 wherein said sensor system [22] further comprises a sleeve [26] for placement in line with fluid flow to a fluid outlet.

9. The apparatus of claim 1 wherein said second temperature sensor [34] comprises an integrated circuit temperature sensor.

10. The apparatus of claim 1 wherein said second temperature sensor [34] comprises a thermocouple.

11. The apparatus of claim 1 wherein said second temperature sensor [34] comprises a sensor system comprising:

a temperature sensor [36];

a radio frequency transceiver [32];

a power supply [40]; and

a housing enclosing said temperature sensor [36], radio frequency transceiver [32], and power supply [40] for protection from the environment.

12. The apparatus of claim 1 further comprising a display device [42] for relaying information to a user.

13. The apparatus of claim 12 wherein said display device [42] is in communication with said first temperature sensor [22] and said controller [38].

14. The apparatus of claim 13 wherein said display device [42] comprises:  
a display [44];  
a radio frequency transceiver [46]; and  
a power supply [48].

15. The apparatus of claim 12 wherein said display device [42] comprises an audio device [52].

16. The apparatus of claim 1 wherein said controller [38] comprises a device selected from the group consisting of EEPROMs, microcontrollers, and microprocessors.

17. A method of determining time remaining for fluid flow at a temperature from a fluid outlet [14] which receives fluid from a fluid source [18], the method comprising:  
providing temperature sensors [22, 34] at a fluid outlet [14] and fluid source [18];  
providing a controller [38];  
sensing fluid temperature at the fluid outlet [14] and fluid source [18];  
communicating sensed fluid temperatures to the controller [38]; and  
determining time remaining for fluid flow at a temperature from the fluid outlet [14] with the controller [38] based upon the sensed fluid temperatures.

18. The method of claim 17 wherein the step of communicating sensed fluid temperatures to the controller [38] comprises communicating sensed fluid temperatures to the controller [38] via a communication link selected from the group consisting of wireless communication links [29] and hardwire communication links [29].

19. The method of claim 18 wherein the step of communicating sensed fluid temperatures to the controller [38] via a wireless communication link [29] comprises:

sensing temperature at the fluid outlet [14];  
converting the sensed temperature to a radio frequency signal [28];  
transmitting the radio frequency signal [28]; and  
receiving the transmitted radio frequency signal at a receiver [32] in

communication with the controller [38].

20. The method of claim 17 further comprising the step of displaying time remaining for fluid flow at a temperature from a fluid outlet [14] on a display [44] [see step 82].

21. The method of claim 20 wherein the step of displaying time remaining for fluid flow at a temperature from a fluid outlet [14] on a display comprises:

converting time remaining information from the controller [38] to a radio frequency signal [32]; and  
transmitting the time remaining radio frequency signal [32] to a receiver [46] in communication with a display [44].

22. The method of claim 17 further comprising the step of displaying fluid outlet [14] temperature on a display [44] [see step 70].

23. The method of claim 22 wherein the step of displaying fluid outlet [14] temperature on a display [44] comprises:

converting sensed fluid outlet temperature to a radio frequency signal [28]; and

transmitting the fluid outlet temperature signal to a receiver [46] in communication with a display [44].

24. The method of claim 17 further comprising the step of audibly indicating [52] the time remaining for fluid flow at a temperature from a fluid outlet [14].

25. A method of determining time remaining for fluid flow at a temperature from a fluid outlet [14] which receives fluid from a fluid source [18], the method comprising:

sensing fluid temperature at a fluid outlet [68];

sensing fluid temperature at a fluid source [72];

comparing at least two sensed fluid temperatures [74, 76, 80, Eqns. 1, 2, 3]; and

determining time remaining for fluid outlet flow at a temperature based upon the comparing step [80, Eqn. 3].

26. The method of claim 25 wherein the step of comparing at least two sensed fluid temperatures comprises subtracting a previously sensed temperature from a later sensed temperature [74, Eqn. 1].

27. The method of claim 25 wherein the step of comparing at least two sensed fluid temperatures comprises determining a rate of temperature change[Eqn. 2] from at least two sensed fluid source temperatures.

28. The method of claim 27 wherein the step of determining time remaining [80, Eqn. 3] for fluid outlet flow at a temperature comprises:

comparing a sensed fluid outlet temperature to a sensed fluid source temperature [Eqn. 3 numerator]; and

determining time remaining for fluid outlet flow at a temperature based upon the comparison between a sensed fluid outlet temperature and sensed fluid source temperature [Eqn. 3 numerator] and the rate of temperature change [Eqn. 2 and Eqn. 3 denominator].

29. A method of determining time remaining for fluid flow at a temperature from a fluid outlet which receives fluid from a fluid source, the method comprising:

providing a fluid outlet fluid temperature [**CT or DT**];  
sensing fluid temperature at a fluid source [72];  
comparing at least two fluid temperatures [74, 76, 80, Eqns. 1, 2, 3,  
**using CT or DT**]; and  
determining time remaining for fluid outlet flow at a temperature based upon the comparing step [80, Eqn. 3].